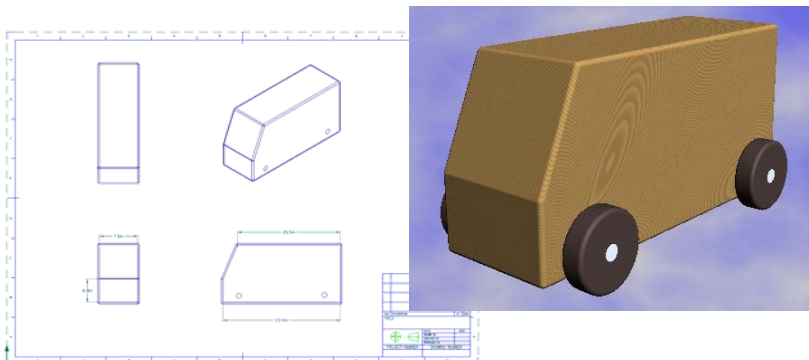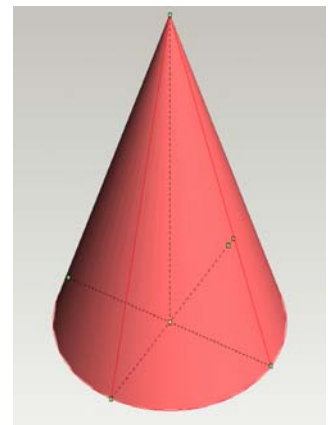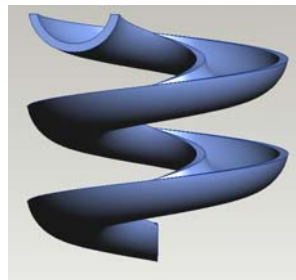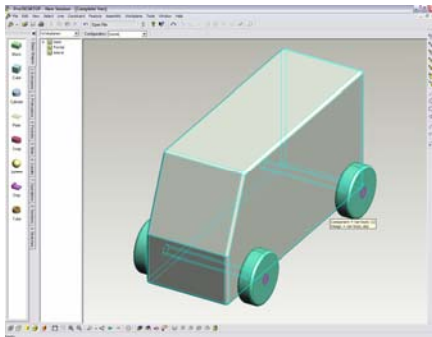# 3-D Solid Modeling and Design

Student Learning Activities

for

PTC

Pro/DESKTOP® 8.0

Activity #9
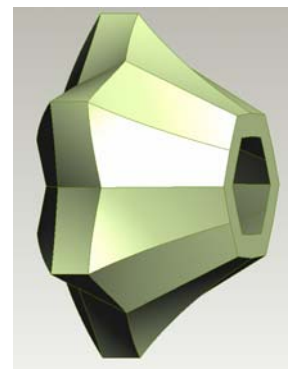
Activity 9:

Project Profile   and Insert Holes
(Flesch-Kincaid readability level = 7.0)

About the program

Pro/Desktop (called 'PD' from now on) is a powerful software program that allows you to sketch ideas first, and then work on design details later.

This activity will help you:
- ➢ Learn how to Project a profile
- ➢ Learn how to Insert Holes
- ➢ Learn various industry terms relating to holes and threads

Project Profile

From Activity #8, you learned how important profiles can be in forming a final design. However, if the design of a particular profile is not going to be circular or cylindrical, then **Revolve** will not work. The **Project Profile** icon (🔲) is simiar to the **Extrude** command. **Extrude** can add or subtract material to a 2D profile when given a **distance**.

Project Profile can add or subtract material to a 2D profile by using one of three choices:
1) Through the entire part
2) To the next face of the part or
3) To a selected face of the part

The rectangle was sketched then **extruded** to 2" above the workplane. A new sketch was made on the top surface and a small circle drawn. The 1" depth of the circle was made by **extruding** below the workplane and subtracting 1" of material. If a **hole was needed completely through** the solid, you could use the **Project Profile** feature with the 'Subtract material' and 'Through the entire part' options. Project Profile can be used to join to existing design faces by simply clicking that option.
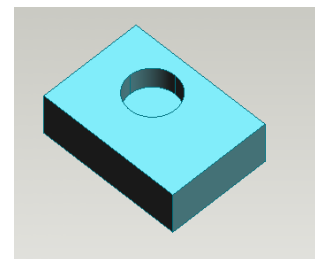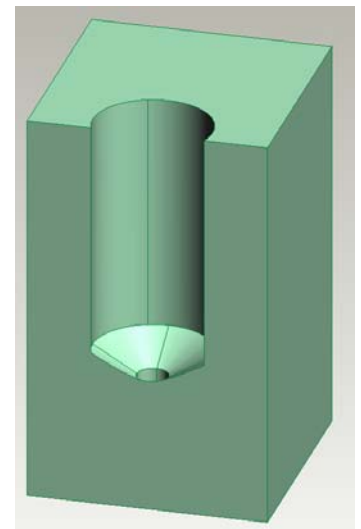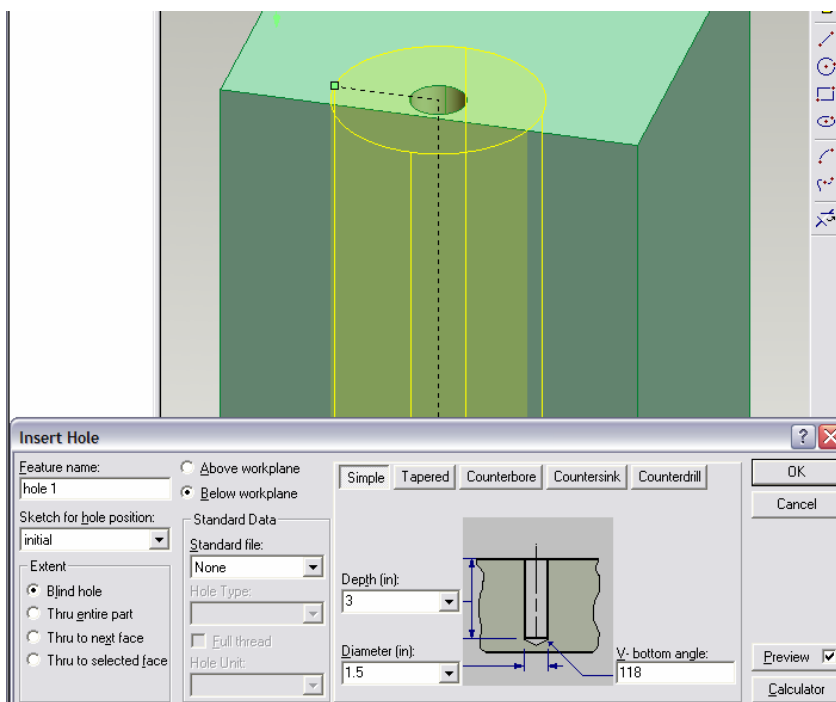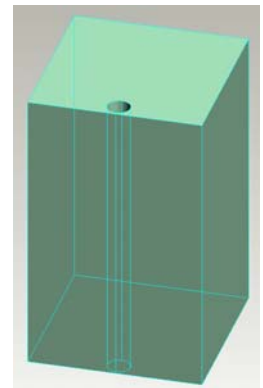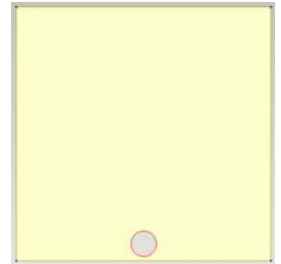
Insert Holes

Often, designers and engineers need to show holes of different sizes, taper, depth, etc. in designed parts. The Insert Hole icon ( ) allows you to draw various shapes of holes that may eventually be drilled out by a machine during the prodcution of your part. Many times, these holes are threaded to accept bolts in holding different parts of a machine together. Insert Hole takes an existing hole and 'drills it out' to whatever diameter, depth, and **thread pitch** (angle of threads machined into a hole). Let's see how!

In a new sketch, draw a square that is 3" x 3". Zoom extents. →
Place a small circle of .3" Ø very near **but not touching the edge**. Extrude the sketch to a design height of 5" by Adding Material **below the workplane**. **SAVE** your design as **Hole Practice.**

Click on the Insert Hole icon. In the dialogue box, make a Blind hole Below the workplane of a 3" depth and a 1.5" Ø. Leave the V-bottom angle at 118°. We will purposely make the hole cut through the edge of the cube to see a partial section of the hole shape. Click OK.
**DO NOT** save your changes to the **Hole Practice** file.

Open the **Hole Practice** file again. Practice using the Insert Hole command using the different types of holes (Tapered; Counterbore; Countersunk; Counterdrill) **without saving changes** to your **Hole Practice** file.
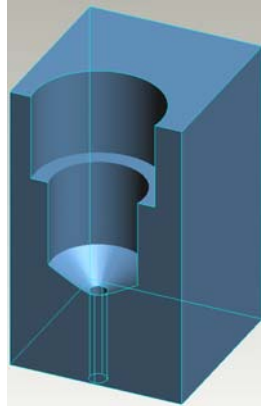HINT: For a tapered hole, use a taper ratio less than .1 (such as .05)
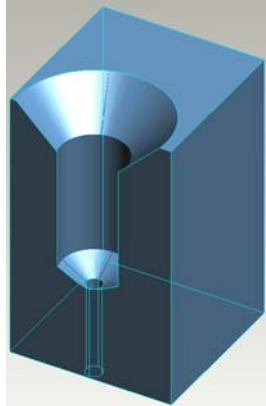
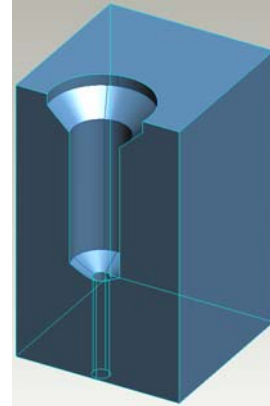**DO NOT** save your changes to the **Hole Practice** file.
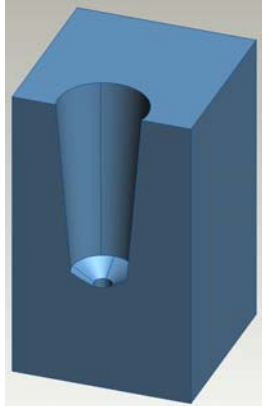
| **Tapered**	**Counterbored**	**Countersunk**	**Counterdrilled**

The **V-Bottom Angle** determines the angle for the bottom of the hole. An angle of 180° creates a flat bottom. 118° creates a standard drilled bottom.

Adding Threads

Since many holes are threaded to hold parts together, PD is used to easily make threads that match industry standards. These standards are the same worldwide for how to cut threads into a hole. They are: ISO standards (International Standards Organization), UNC (Unified National Coarse) threads, and UNF (Unified National Fine) threads.

Open the **Hole Practice** file. Click on the Insert Hole icon. In the dialogue box, enter all the information as follows:
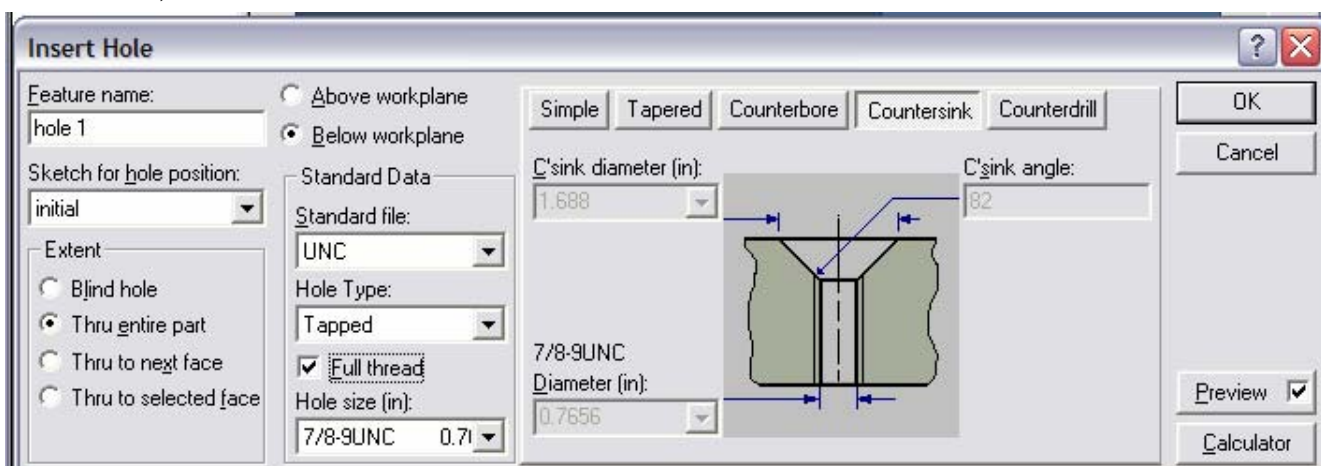
The 'Hole Size' of 7/8-9UNC means:
▸ 7/8" Ø hole
▸9 threads-per-inch for the entire hole length
▸Unified National Coarse thread pitch
▸The countersunk Ø and angle are automatically set for you as per UNC standards.

Click OK. The threads are automatically added at the correct size and industry standard through the entire hole. Can you imagine having to draw these by hand? The view here is a Wireframe (F9 key) to better see the threads:
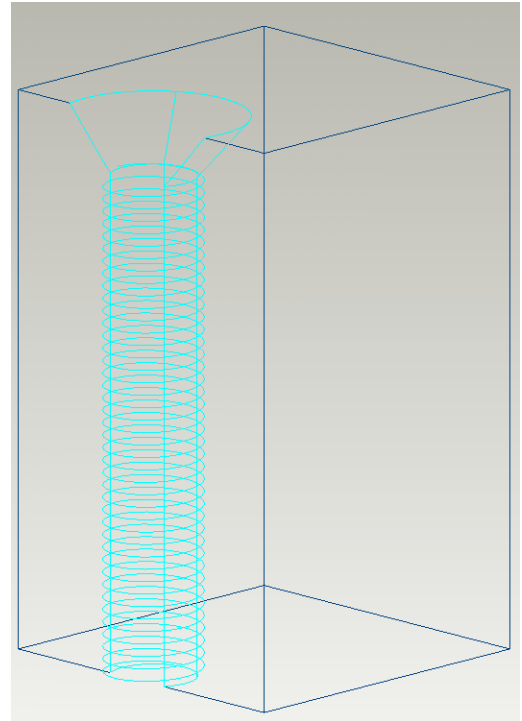
DO NOT save your changes to the **Hole Practice** file.

You have completed this activity using PD! Please exit the program.